WORKSHEET A

Assessing and reducing the risk of ground-water contamination

Site Evaluation

Keeping Idaho's Water Clean

Worksheet A

Why is the site evaluation important?

How homestead practices such as pesticide handling or wastewater disposal affect your ground water depends in part on the physical characteristics of the soil and geologic materials at your home site. These characteristics will control the physical and chemical response of contaminants that are introduced into the subsurface.

Although the focus of **Home*A*Syst** is on protection of the **ground water and drinking water**, preserving surface water quality is also important. Implementing the best management practices (BMPs) recommended in the fact sheets can also help protect **surface water** in two ways. First, implementing some BMPs may reduce runoff, which often carries significant amounts of contaminants to surface waterbodies. Second, because ground water is connected to surface water, contaminants that are transported to an aquifer may end up in downstream rivers, lakes, or wetlands. The dynamic interaction between surface and ground water is called **hydraulic continuity**. More information concerning hydraulic continuity can be found in the accompanying materials.

What is involved in completing this evaluation?

This evaluation has four parts:

Part 1: Evaluating the soil at your homestead
Part 2: Evaluating the geologic material at your homestead
Part 3: Combining the soil and geologic risk ranking
Part 4: Diagraming your homestead (optional)

Obtaining the information to complete parts 1 and 2 may require assistance from outside sources, such as your county Soil Conservation District (SCD), Natural Resources Conservation Service (NRCS) or Cooperative Extension System (CES) office. How long this takes will vary depending on availability of information in your county. Once you have the information, though, it should take about an hour to complete the first three parts of Worksheet A. The homestead diagram will take additional time.

Glossary
Site Evaluation

These definitions may help clarify some of the terms used in Worksheet A.

Basalt: A fine grained, dark colored volcanic rock (Example: Snake River Plain Basalt in south-eastern Idaho).

Bedrock: Solid rock that underlies soil or other unconsolidated material.

Granite: A light colored, silica rich rock formed by the slow cooling of molten rock (Example: Idaho Batholith in central Idaho).

Limestone: A rock that is mostly composed of calcium carbonate.

Microorganisms: An organism that is microscopic in size (Example: bacteria).

Organic matter: Matter containing carbon compounds that originated from plant and animal matter.

Perched water table: A soil or non-soil material that is saturated by water, but lies above the main water table. It is formed by water that infiltrates the soil and is collected on or restricted by an impermeable layer, such as a clay lens.

Pore space: The space between individual grains of a sediment or rock.

Permeability: The quality that enables water or air to move through soil or rock. The opposite of permeable is "impermeable" (Example: Clay is relatively impermeable as compared to sand).

Soil classification: A system to provide detailed soil descriptions. The descriptions are based on soil properties such as color, texture, pH, organic content, and soil depth.

Soil drainage class: The condition of water saturation or partial saturation that existed during the development of the soils. Different classes are described by such terms as excessively drained, well drained, and poorly drained.

Soil horizon: A layer of soil that has distinct characteristics, such as color or texture. Soils are grouped as A, B, C horizons.

Soil mapping unit: A soil or combination of soils drawn on a map and where possible include unit names.

Soil series: Soils that are essentially alike in all major characteristics.

Soil texture: The relative proportions of sand, silt, and clay that make up a soil. Described in terms such as sandy loam and silty clay.

Subsoil: The B soil horizon.

Unconsolidated alluvium: Deposits of clay, silt, sand, gravel, and boulders. These sediments have been deposited by water from glaciers, rivers, lakes, etc.

Water table: The zone in the soil or subsurface that is saturated with water. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment.

How do soils affect the potential for ground-water contamination?

Soil characteristics are very important in determining whether a contaminant breaks down to harmless compounds or leaches into ground water. Because most contaminant breakdown occurs in the soil, a greater potential for ground-water contamination exists in areas where contaminants are able to move quickly through the soil.

While held to soil particles, contaminants are broken down by bacteria and other soil organisms and by chemical reactions with minerals and natural chemicals in the soil. Most of this chemical and biological breakdown takes place in the surface layers, where the soil may be warm, moist, high in organic matter, and well aerated.

Sandy soils have large pore spaces between individual particles, and dissolved contaminants can move rapidly through the soil and into ground water. Also, sandy soils provide little surface area onto which contaminants can become attached or "adsorbed." On the other hand, clay soils are made of very small particles which slow the movement of water and dissolved contaminants through the soil. Some contaminants become strongly attached to clay particles. And finally, soils that are high in organic matter provide an excellent environment for chemical and biological breakdown of contaminants.

How do subsurface and geologic materials affect the potential for ground-water contamination?

Materials that lie below the soil, or geologic materials, vary depending on where you are located geographically. In Idaho, this material varies from deposits of clay, silt, sands, gravels, and cobbles (called unconsolidated alluvium), basalt, mixed layers of volcanic deposits and sediments, granite, or in a few areas, limestone.

The nature of the materials can affect the potential for ground-water contamination. Contaminants can move very quickly through deposits of sand, gravel, and cobble, fractured basalt or granite, or limestone with connected solution cavities. On the other hand, deposits of clay and silt will slow the movement of contaminants.

In general, it can be said that all the major ground-water systems in Idaho have either medium high to high potential for becoming contaminated. The presence or absence of clay above the water table seems to be the leading factor that reduces the potential for contamination. Another factor, the depth to the water table, has often been observed to be a much less significant factor.

A word of caution

As with the results of the previous assessment worksheets, use the rankings from this worksheet cautiously. Many factors affect whether or not a contaminant will reach the ground water. There is no guarantee that a "low risk" site will be uncontaminated, or that ground water will become contaminated at a "high risk" site. The type of contaminant involved, how you handle and store potential contaminants, and many other factors can affect the potential for ground-water contamination.

Part 1: Evaluating the Soil on Your Homestead

To complete your soil evaluation, you will need a copy of your county's soil survey report. This report is available at most county Soil Conservation District (SCD), Cooperative Extension System (CES), or Natural Resources Conservation Service (NRCS) offices.

NOTE: If you would like assistance in this part, ask you local CES, NRCS, or SCD personnel for help. It is important that this portion of the evaluation be done.

Step 1: Identify the soils.

- Locate your homestead on the aerial photo in the county soil survey.
- Note the soil mapping unit indicated on the photo, identify the unit name, and find the information on that unit in the written section of the report.
- Transform the soil mapping unit boundary lines from the soil survey to the homestead diagram on page 12.

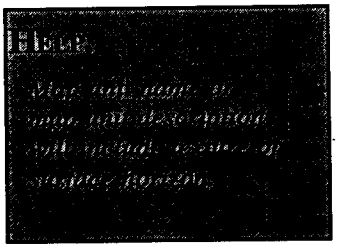
Step 2: Rank the soil unit(s)

- Using the information found from Step 1, rank your soil using the "Soil Characteristics" section on the next 3 pages. If there is more than one soil mapping unit on your property, rank each one individually and enter the score in the spaces provided.

Soil characteristics

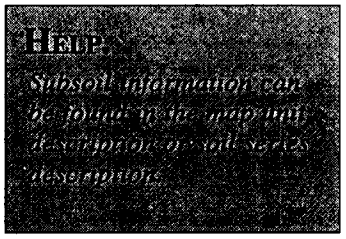
[redacted]

		Score
1. Texture of soil surface layer (A Horizon)	loam, silt loam, sandy clay loam, silt	9
	clay, sandy clay, silty clay, clay loam, silty clay loam	8
	loamy fine sand, loamy very fine sand, fine sandy loam, very fine sandy loam	4
	sand, loamy sand, sandy loam, organic materials (all "0" horizons), and gravelly loam	1

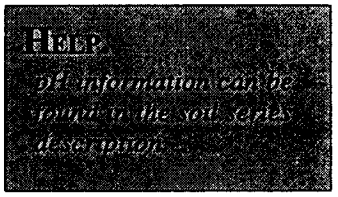


Your score(s) soil 1 ____ soil 2 ____ soil 3 ____

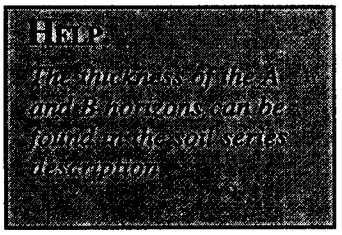
2. Texture of subsoil layer (B Horizon) or 2 feet below the A Horizon	clay, sandy clay, silty clay, silt	**10**			
	sandy clay loam, loam, silt loam, clay loam, silty clay loam	**7**			
	loamy fine sand, loamy very fine sand fine sandy loam, very fine sandy loam	**4**			
	sand, loamy sand, sandy loam, organic materials, and gravelly loam	**1**			
	Your score(s)		**soil 1**	**soil 2**	**soil 3**



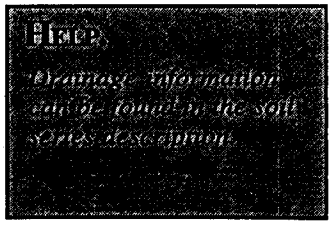
3. ph of soil surface (A Horizon)	pH is 6.6 or greater or described as neutral, mildly alkaline, moderately alkaline, or strongly alkaline	**6**			
	pH is less than 6.6; described as slightly acid, moderately acid, or strongly acid	**4**			
	Your score(s)		**soil 1**	**soil 2**	**soil 3**



4. Thickness of the A and B Horizons	60 inches or greater	**10**			
	40-59 inches	**8**			
	30-39 inches	**5**			
	less than 30 inches	**1**			
	Your score(s)		**soil 1**	**soil 2**	**soil 3**

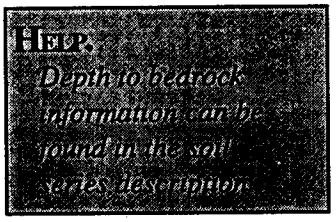


5. Soil drainage classification	well drained	**10**			
	well to moderately well drained	**7**			
	moderately well drained	**4**			
	somewhat poorly, poorly, and very poorly drained; somewhat excessively and excessively drained	**1**			
	Your score(s)		**soil 1**	**soil 2**	**soil 3**



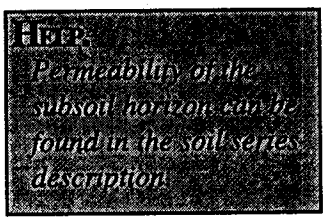
6. Permeability of subsoil (B horizon)

a. If bedrock is found within 20 to 40 inches of the surface, use the following to assign a rank:



	Score
bedrock at 21–40 inches	3
bedrock within 20 inches	1

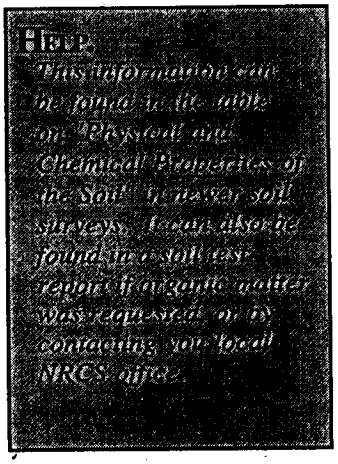
b. If there is no bedrock near the surface, rank the permeability of the subsoil horizon using the following descriptions.



	Score
very slow, slow, and moderately slow	10
moderate	8
moderately rapid	3
rapid to very rapid	1

	soil 1	soil 2	soil 3
Your Score(s)			

7. Organic matter content (%) (Ap horizon or 0-6"depth from surface)



	Score
high (4-10%)	10
medium (2-4%)	7
moderately low (1-2%)	5
low (0.5-1%)	3
very low (less than 0.5%)	1

	soil 1	soil 2	soil 3
Your Score(s)			

Step 3: Add your seven scores together for each soil you ranked.

Total(s)	soil 1	soil 2	soil 3

Step 4: In the box below, in the left column, find the range within which your total score lies. From the total score, move horizontally to the middle column and identify your soil's "potential to protect ground water." Then find the risk rank number assigned to your score.

Total Score	*Soil Potential to Protect Ground Water*	*Risk Rank*
51+	**Good**	**4**
41-50	**Fair**	**3**
31-40	**Marginal**	**2**
0-30	**Poor**	**1**

Step 5: Enter risk rank number(s) here:

Soil	Risk Rank
1	
2	
3	

Step 6: Understand what your soil risk rank means.

In soils with a score of more than 50 points (*risk rank 4*), potential contaminants move slowly, allowing them to become attached to soil particles. Sunlight, air, and microorganisms then have the potential to break down the contaminants. The ground-water contamination risk level may be lowered.

In a soil with a score of 30 or less (*risk rank 1*), most contaminants move rapidly down toward the water table and are not degraded.

In soils with a score between 30 and 50 (*risk rank 2 and 3*), potential contaminants will move more slowly than in soils of *rank 1* but more rapidly than soils with a *rank 4*. Potential contaminants may be somewhat degraded and the risk for ground-water contamination may be somewhat reduced.

Part 2: Evaluating Geologic Materials Beneath Your Homestead

This part looks at the geologic materials beneath your homestead soils. By combining both the soil and the geology evaluation (Part 3), there will be a much clearer picture of your site's potential for keeping pollutants out of ground water.

For simplification, we are considering all ground-water systems, whether it is in basalt, unconsolidated alluvium, etc., to have a high potential for contamination unless there are clay layers present over a wide spread area. Thus this evaluation requires the knowledge of the presence or absence of clay layers above the water table. This information can be obtained from the following sources:

• A well log description of your well or if that is not available, from a well log description from the nearest neighboring well. Well logs for wells drilled after 1972 should be on file with the Idaho Department of Water Resources (IDWR). IDWR has regional offices in the following areas:

North (Coeur d' Alene):	(208) 769-1422
Southwest (Boise):	(208) 334-2190
South Central (Twin Falls):	(208) 736-3033
Eastern (Idaho Falls):	(208) 525-7161

Be prepared to provide the legal description (*county, township, range, section, and 1/4 of a 1/4 section or 40 acres*) of the well location. If known, provide the year the well was installed and the owner's name at that time. A nominal amount may be charged for copying the log.

• Published hydrogeological reports. The United States Geological Survey (USGS), IDWR, Division of Environmental Quality (DEQ), and universities and colleges are organizations that may have a report that covers your area.

Step 1: Find the information you need from the suggested sources.

Step 2: Read the well log description or the hydrogeologic description to determine if there are any clay layers above the water table at your homestead.

Step 3: If there are abundant clay layers present, your rank is 3.
If there are minimal clay layers present, your rank is 2.
If there are no clay layers present, your rank is 1.

Step 4: Place your geologic risk rank here. **Geologic Risk Rank** ☐

Geologic Risk Rank	Level of Risk of Ground-water Contamination
1	High
2	Moderate
3	Low

Part 3: Combining the Soil and Geologic Risk Rankings

Combining the rankings from parts 1 and 2 will provide you with a good overall ranking of your homestead site's potential to keep pollutants from moving down to ground water.

Step 1: Transfer your boxed rankings from the soil evaluation (part 1, page 7) and the geologic rank (part 2, page 8) to the boxes below.

Soil 1 Rank	☐	**Geological Rank**	☐
Soil 2 Rank	☐		
Soil 3 Rank	☐		

Step 2: The table below shows the overall level of ground-water contamination risk associated with your homestead site conditions. Find your two numbers **written in the correct sequence** (soils rank---geological rank) and circle the sequence.

Combined Level of Risk		
Low Risk (Rank 3)	**Moderate Risk (Rank 2)**	**High Risk (Rank 1)**
2-3	**1-3**	**1-1**
3-3	**2-2**	**1-2**
4-3	**3-2**	**2-1**
	4-2	**3-1**
	4-1	

Step 3: Look above the sequence you circled to find your risk level and your rank. (For example, if your numbers are 3-2, your site is in the moderate risk column and your rank is 2).

Step 4: Enter your combined rank here. (If you calculated more than one soils ranking, calculate a combined ranking for each soil's ranking)

Combined Rank 1 ☐

Combined Rank 2 ☐

Combined Rank 3 ☐

Step 5: Understand your combined rank.

For instance, a site with a combined rank of 3 (low ground-water pollution risk) will have a soil with a good capacity to hold and break down contaminants. Its subsurface condition will also keep contaminants from reaching the water table. Under certain conditions, however, such as spills, heavy rainfall, or poor management, contaminants may reach ground water.

On the other hand, if you carefully manage a site with a combined rank of 1 (high ground-water pollution risk), you may not affect your drinking water. **Both site characteristics and your management practices are of equal importance.**

Your three site ranks (soils rank, geologic rank, and combined rank) will be used again in Worksheet B. They will be combined with your risk rankings for specific activities from the assessment of potential ground-water contamination on your homestead.

If you have more than one soil on your homestead, you will need to transfer individual soil ranks and combined ranks to Worksheet B. It will be especially important for you to complete part 4 of this worksheet if you have more than one soil on your homestead, so that you can link particular site vulnerability with each homestead activity.

You may now proceed with part 4 of this worksheet, or you may go directly to Worksheet B.

Part 4: Learning More About Your Site

Sketching a diagram of your homestead can provide useful information to help you understand how the physical layout, site characteristics of your homestead, and location of activities may contribute to, or lessen, the possibility of contaminants reaching your drinking water.

Step 1: Begin by looking at the sample diagram on the following page.

Step 2: Sketch a diagram of your homestead on the blank grid provided on page 12 and include the following items:

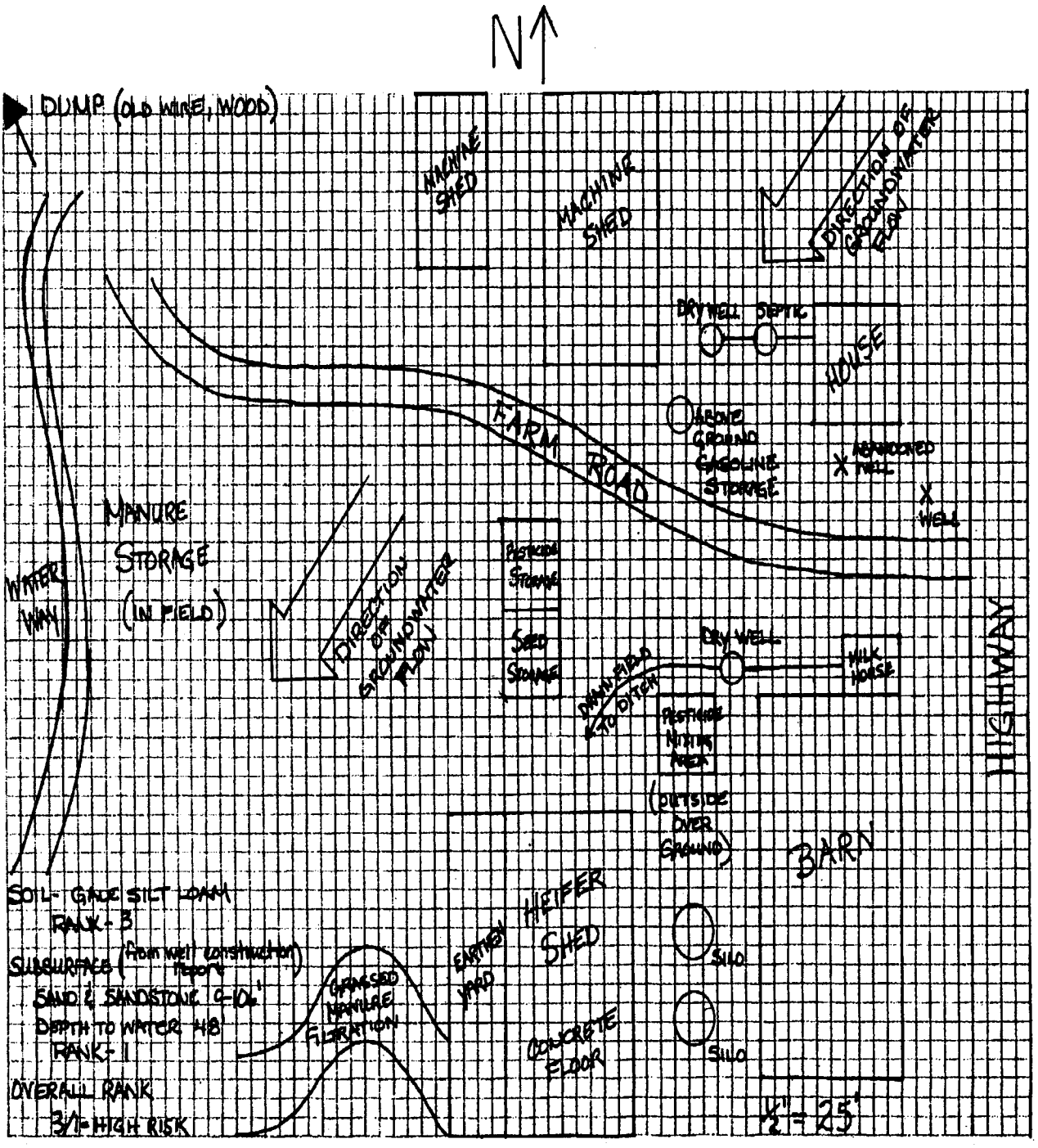
-buildings and structures
-wells and unused wells
-septic system (tank, dry well, absorption field)
-animal lots (current and/or abandoned)
-manure storage (temporary and permanent)
-underground storage tanks
-above ground storage tanks
-pesticide and fertilizer storage
-silage storage
-milkhouse waste disposal system (tank, field and/or ditch)
-farm dumps
-vehicle maintenance areas
-liquid disposal areas
-tile and open ditch drains
-surface water (ponds, streams, irrigation canals)
-direction of landslope
-direction of groundwater flow
-different soil types

You can use the same diagram to indicate surface water (ponds and streams), direction of landslope, ground-water flow, and the different soil types found around your homestead. Generally, ground water follows surface topography and moves downhill towards surface water.

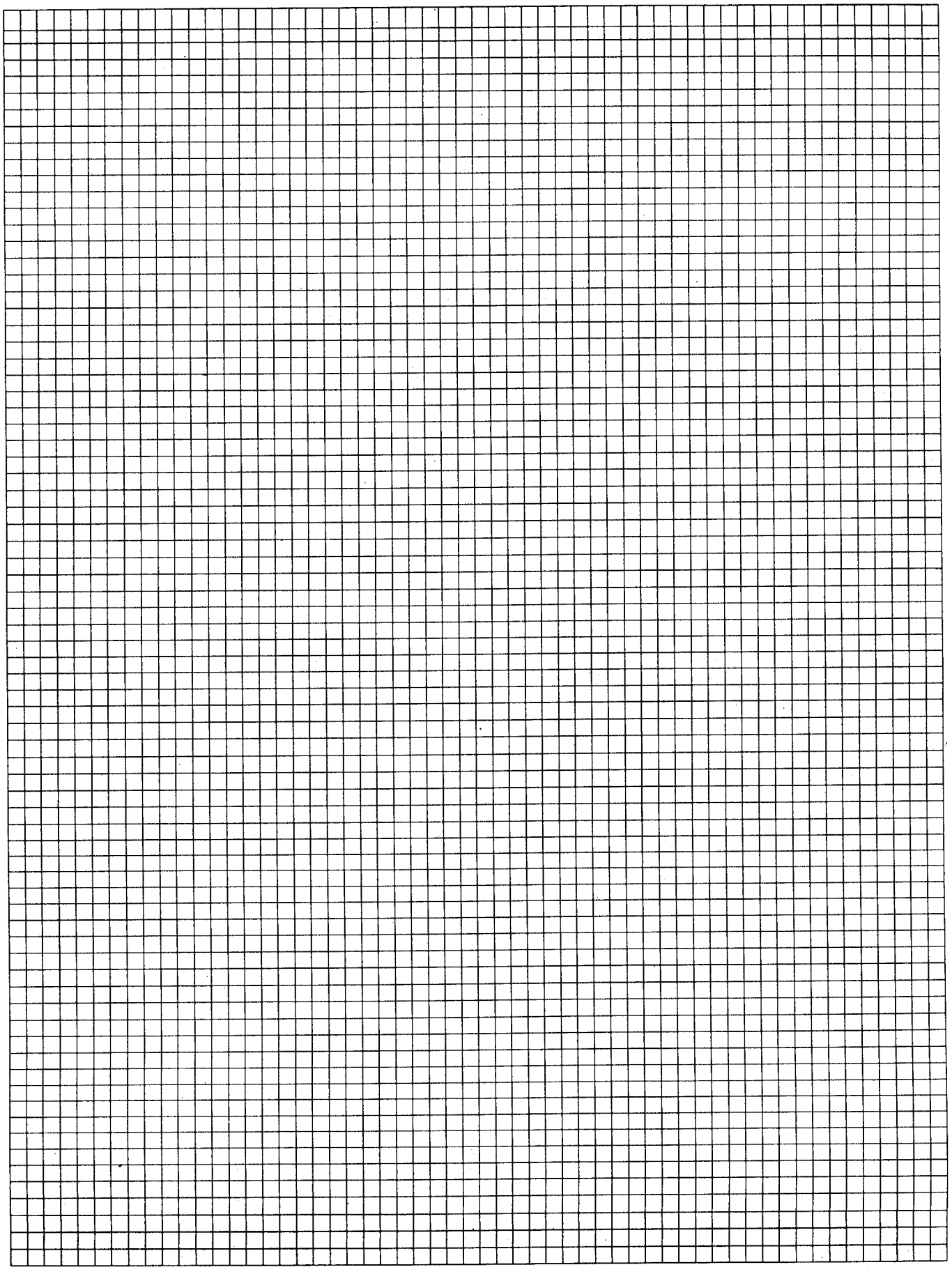
Step 3: Use your diagram to note which activities or structures on your homestead have a greater likelihood of allowing contaminants to reach ground water. This information should help prepare you to make better decisions about your homestead activities and structures and how they might be affecting your drinking water.

Step 4: When you've completed the diagram of your homestead, go on to Worksheet B.

Sample Homestead Diagram



YOUR HOMESTEAD DIAGRAM



NOTES

The Homestead Assessment System is a cooperative project developed, coordinated, and supported by the following agencies and organizations:

Idaho Association of Soil Conservation Districts (IASCD)
Idaho Department of Agriculture (IDA)
Idaho Department of Health and Welfare-Division of Environmental Quality (IDHW-DEQ)
Idaho Department of Water Resource (IDWR)
Idaho Public Health Districts
Idaho Soil Conservation Commission (SCC)
Idaho Water Resources Research Institute (IWRRI)
University of Idaho-Cooperative Extension System (CES)
USDA-Farm Service Agency (FSA)
USDA-Natural Resources Conservation Service (NRCS)
USDA-Rural Economic and Community Development (RECD)
U.S. Environmental Protection Agency (EPA)

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Information derived from **Home*A*Syst** worksheets is intended only to provide general information and recommendations to rural residents regarding their own homestead practices. All results are confidential.

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